SOME NOTES ON THE YORKSHIRE COALFIELD AND ITS EASTWARDLY EXTENSION.

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It is impossible to attempt more than an outline sketch of two or three salient features of the geology of the Yorkshire Coalfield, and any description must be something like a magazine story, "to be continued in our next." It may be completed sometime in the next century when the eastern boundary of the Coalfield has been explored. In this respect the Yorkshire Coalfield differs from some others in this country to which the boundaries are completely traced, for instance, the Irish Coalfields are fully exposed. The boundaries of the Scotch and Northumberland Coalfields are known, except that they dip under the sea. The same remark applies to the Durham Coalfield, except the southern corner, which is covered by newer formations. The great Coalfield of Glamorgan and Monmouthshire has its boundaries well-defined, and the same may be said of the small Coalfield of the Forest of Dean. The Coalfields, however, of Somersetshire, South Gloucestershire, Staffordshire, Warwickshire, Leicestershire, Cheshire, Denbighshire, Shropshire, South West Lancashire and Cumberland are each unexplored on one side at least, and the newly-discovered Coalfield at Dover has not yet been seen by the eye of man in any part. It is therefore evident that the next century will provide plenty of work for those who explore our Coalfields, but of all the storehouses of fuel there is none more likely to be vigorously explored than that great Coalfield which stretches from the latitude of Leeds, on the north, to the neighbourhood of Nottingham, on the south.

At a period before the geological maps of Yorkshire were published, the writer had occasion to make a geological examination of this Coalfield, and to prepare plans and sections for the use of the Royal Coal Commission, and in the year 1879 he contributed a paper to this Society on some of the features of this Coalfield. The writer has prepared a plan and sections to illustrate these notes.

Figure I. is a plan of the Coalfield showing the outcrops of three of the best known seams of Coal, also the Millstone Grit below The outcrops of the Permian, New Red Sandstone. Lias and Oolite are also shown.

Figure II. is a longitudinal section from north to south of the Coalfield, along a line drawn through some of the collieries. The total length of the section is sixty-eight miles.

Transverse sections were also shown, one across the Coalfield from west to east in North Derbyshire, and another from west to east along a line of latitude about two miles south of Leeds.

These two transverse sections, one on the extreme north and the other on the extreme south of the Yorkshire Coalfield agree in showing a continuous dip from west to east, except the eastern end of the northern section, where a slight eastwardly rise has been noted. The question is, is this eastwardly rise merely a local variation or does it mark the beginning of the general eastwardly rise which will be continued till the coals crop out against the lower surface of the Permian formation. Everybody admits that the Coalfield ends somewhere before the coasts of Denmark are reached.

Those who are most sanguine think that the Coalfield extends under the whole of Lincolnshire. Others think the river Trent represents the eastern boundary of the Coalfield.

It may be interesting to consider for a few moments how far the evidence that now exists throws any light upon this problem.

There are three important boreholes. No. 1 is the deep boring for coal at Scarle. No. 2 is the boring near Carlton and Snaith, and No. 3 is the boring near Haxey, between Doncaster and Gainsborough. The Scarle boring reached a depth of 2,030 feet, and passed through 1,425 feet of New Red Sandstone ; the strata at the bottom of the borehole were never fully identified. The boring near Scarle, whatever it proved, has not yet led to any further developments, and the details have not been published. The boring near Haxey has reached a depth of nearly 1,100 yards, and it has been publicly stated that a seam of coal supposed to be the Barnsley bed has been found at that great depth.

Figure III. is a section drawn from the north-western corner of the Coalfield at Denholme, through Batley, Wakefield, Hemsworth, Doncaster and past Gainsborough.

The faults are not shown on the section, but the dip is averaged from the outcrop to the deepest point. The writer thinks it quite reasonable to omit the faults from this section because he has observed that in this Coalfield a seam of coal descends from the outcrop to the deepest place where it has been proved sometimes by a general dip and sometimes in steps. These steps are the faults, but for the purpose of a general section such as this it does not matter whether the dip is shown as proceeding along a slope or whether the detail of the steps or faults is shown.

One of the most interesting questions is that of the level of the upper surface of the Carboniferous formation where this formation is covered up by the Permian. In the section the present average inclination of the Carboniferous land surface is shown having a gentle dip from west to east. Another dotted line shows the possible inclination of the Carboniferous land surface before the Permian was deposited and the denudation of the Coalfield was completed down to its present level. If that inclination should continue there must be an enormous thickness of more recent formations. It is, however, possible and probable that the easterly dip of the ancient surface is less rapid, and it is possible that there may be a ridge of the Carboniferous formation under Gainsborough. That the inclination of the old land surface flattens appears to be now proved by the boring near Haxey.

The total thickness of the Yorkshire Coal Measures has not yet been definitely ascertained. It may be that east of the Permian outcrop the dip of the Coal Measures may in some places be steeper than the dip of the Permian, in which case there will be room for a greater thickness of Coal Measures above the Barnsley bed than has yet been proved. It is believed that the section line No. III. is taken along the deepest or one of the deepest troughs of the Coalfield.

At Deholme there is the greatest westerly extension ; along the northern outcrop of the Coalfield there is a southerly dip, for instance,

at the now closed Newton Colliery, near the northern outcrop, the Warren House coal, which corresponds to the Barnsley bed, lies about 500 feet below the sea level, giving a dip of 1,300 feet in ten miles from north to south. Going further south, the coal rises from South Kirby to Denaby Main, where, on the corresponding line of longitude, this coal is only 1,200 feet in depth. It is, therefore, evident that South Kirby is very nearly in the centre of a trough from which the coal rises north and south and west. There will also be from South Kirby a gradual eastwardly dip.

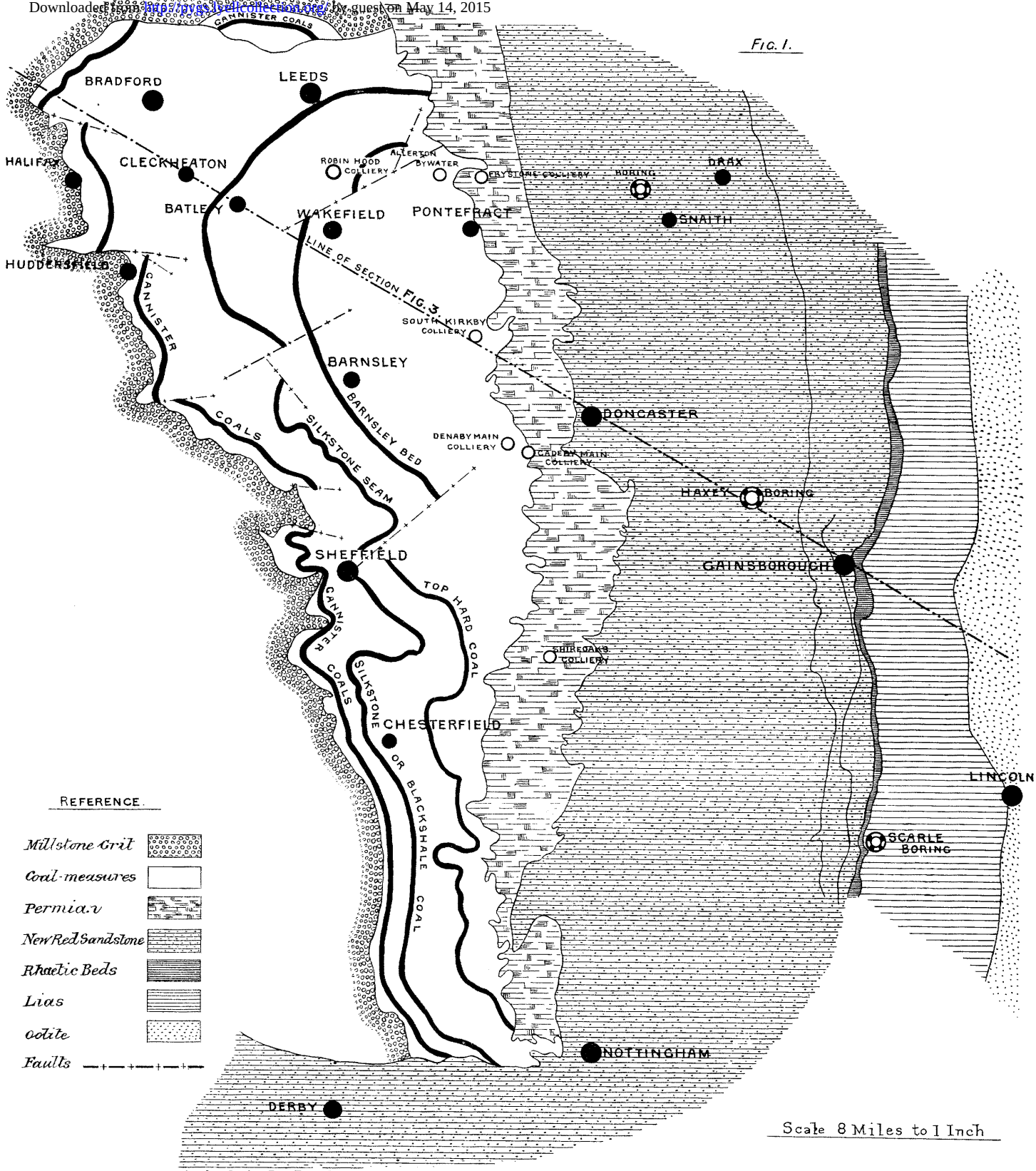
The deepest shaft yet sunk to the Barnsley bed is that at Cadeby, about four and a-half miles south-west of Doncaster, where the coal is 750 yards deep. Judging from the rate of inclination down to the east, proved by the dip of the coal from the outcrop near Barnsley to Cadeby, it is probable that the depth under Doncaster will be about 1000 to the Barnsley bed, and it may be a little more and it may be a little less.

The total thickness of the Yorkshire Coalfield yet proved down to the Millstone Grit is about 4,700 feet, or in round figures 5,000 feet. There are altogether about fifty seams of coal, and the total thickness is over 100 feet.

At the present time coal seams are worked in Yorkshire varying in thickness from about 14 inches to 10 feet. A 14-inch coal can only be profitably worked under peculiar local conditions, and it is only in a few localities that 10 feet of coal are found workable in one seam. In Yorkshire any coal under 3 feet is classed as a thin seam.

The Coalfield is roughly divided into two districts by a line of longitude passing through Leeds. Westward of this line of longitude is the thin coal district and eastward is the thick coal district. In the thin coal district the coal is got in the proximity of the town and factory where it is used, though the working cost is pretty high, amounting to 7s. or 8s. a ton. In the district to the east the coal seams are 3 feet and upwards and the cost of working is greatly reduced, but the larger collieries have to send most of their coal some distance by railway or canal. Before this Coalfield is exhausted every seam of coal over 4 inches in thickness will be worked, and in

many districts, where thick coals have been worked and exhausted, the old wastes will be worked over again for the sake of the slack, the pillars, and beds of inferior coal that have not been considered good enough for the market. When this time comes the average price of coal at the pit top will be perhaps 20s. a ton, and the smoke nuisance will be considerably abated.



TO ILLUSTRATE PROF. ARNOLD LUPTON'S PAPER ON "SOME NOTES ON THE YORKSHIRE COALFIELD AND ITS EASTWARDLY EXTENSION."

FIG. 2. SECTION

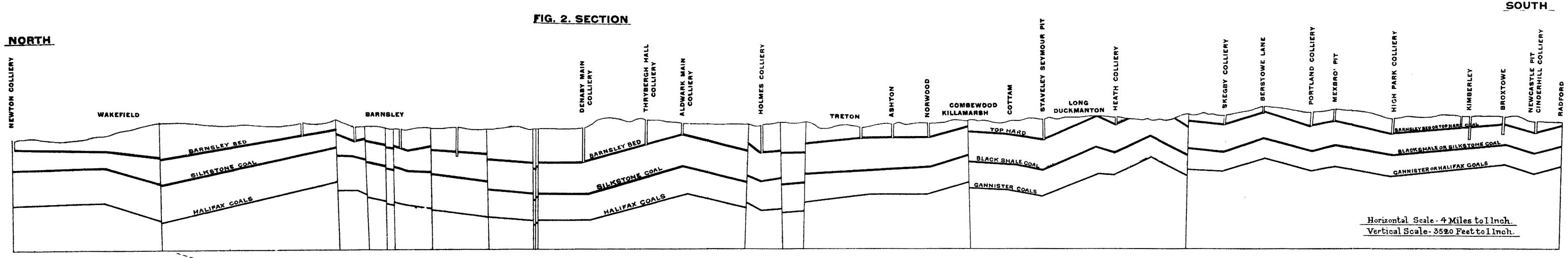
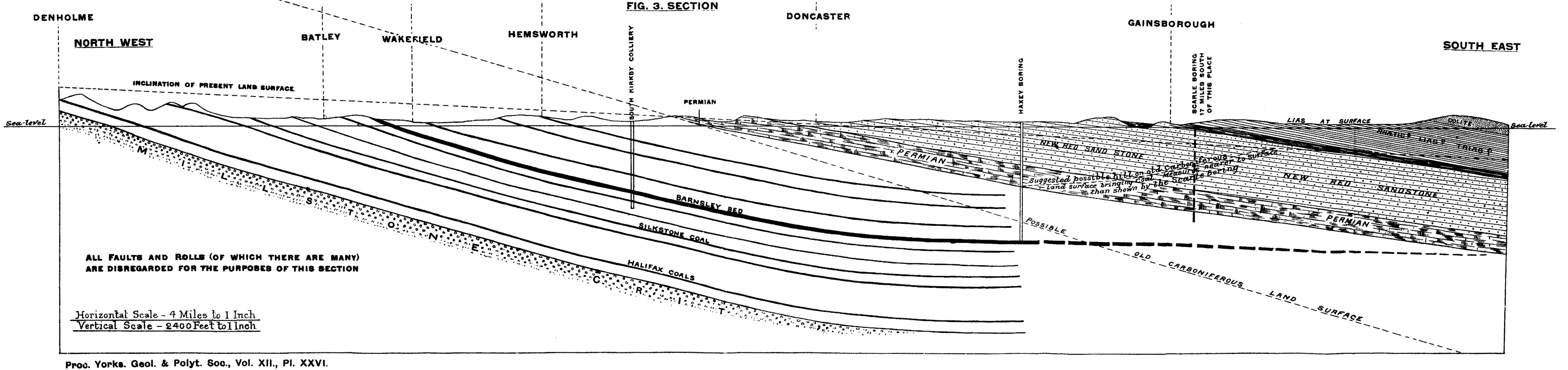


FIG. 3. SECTION



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